

CLAIMS:

1. A Raman gain measuring method comprising steps of:
inputting a CW probe light into a Raman amplifying medium;
generating a Raman pumping light being binary-
5 intensity-modulated by a modulation factor;
inputting the modulated Raman pumping light into the
Raman amplifying medium;
extracting two index values regarding to an AC component
and a DC component of the probe light having propagated in the
10 Raman amplifying medium; and
determining the Raman gain of the Raman amplifying medium
from the two index values and modulation factor.
2. The method of claim 1 wherein the step of inputting the
15 Raman pumping light into the Raman amplifying medium comprises
a step of inputting the Raman pumping light into the Raman
amplifying medium so that the Raman pumping light propagates
in the opposite direction with the probe light.
- 20 3. The method of claim 1 wherein the step of extracting two
index values regarding to the AC component and the DC component
of the probe light having propagated in the Raman amplifying
medium comprises steps of:
converting the probe light having propagated in the Raman
25 amplifying medium into an electrical signal using a
photodetector; and
extracting the two index values from the electrical
signal.
- 30 4. The method of claim 1 wherein the step of extracting two
index values regarding to the AC component and the DC component
of the probe light having propagated in the Raman amplifying
medium comprises steps of:

converting the probe light having propagated in the Raman amplifying medium into an electrical signal using two photodetectors; and

5 extracting the two index values from respective electrical signals output from the two photodetectors.

5. The method of claim 1 wherein the two index values comprise an index value to show the amplitude of the AC component and an index value to show the amplitude of the DC component.

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6. The method of claim 1 wherein the one of the two index values comprises either an index value to show a level of the probe light propagated in the Raman amplifying medium at a first power level of the binary-intensity-modulated Raman pumping light or an index value to show a level of the probe light propagated in the Raman amplifying medium at a second power level of the binary-intensity-modulated Raman pumping light.

7. A Raman gain measuring apparatus to measure Raman gain in a Raman amplifying medium comprising:

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a probe light source to generate a probe light composed of a CW laser light and to apply the probe light to the Raman amplifying medium;

25 a pumping light source to generate a pumping light to be binary-intensity-modulated by a modulation factor at a predetermined frequency;

a pumping light coupler to apply the pumping light output from the pumping light source into the Raman amplifying medium;

30 an index detector to detect two index values regarding to an AC component and a DC component out of the probe light having transmitted the Raman amplifying medium; and

a computing unit to determine Raman gain of the Raman amplifying medium out of the two index values detected by the

index detector and modulation factor.

8. The apparatus of claim 7 wherein the pumping light source comprises a pumping laser diode to generate a continuous wave
5 laser light and an intensity modulator to binary-modulate the output light from the pumping laser diode by the modulation factor at the predetermined frequency.

9. The apparatus of claim 8 wherein the intensity modulator
10 comprises an optical switch.

10. The apparatus of claim 8 wherein the index detector comprises:

a photodetector to convert the probe light transmitted
15 the Raman amplifying medium into an electrical signal; and
an index measuring apparatus to measure two index values regarding to an AC component and a DC component out of the electrical signal output from the photodetector.

20 11. The apparatus of claim 10 wherein the index measuring apparatus comprises a detector to detect the component of the predetermined frequency out of the electrical signal from the photodetector.

25 12. The apparatus of claim 10 wherein the index measuring apparatus comprises an AC detector to detect an AC component of the electrical signal from the photodetector and a DC detector to detect a DC component of the electrical signal from the photodetector.

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13. The apparatus of claim 6 wherein the index detector comprises a level detector to detect out of the output from the photodetector either a level of the probe light having

propagated the Raman amplifying medium at a first power level of the binary-intensity-modulated Raman pumping light or a level of the probe light having propagated the Raman amplifying medium at a second power level of the binary-intensity-modulated Raman pumping light; and a detector to detect one of the AC component and DC component out of the output from the photodetector.

14. The apparatus of claim 8 wherein the index detector comprises:

an optical splitter to split the probe light having transmitted the Raman amplifying medium into two portions;

a first photodetector to convert one of the output lights from the optical splitter into an electrical signal;

a second photodetector to convert the other output light from the optical splitter into an electrical signal;

a first index measuring apparatus to measure one of the two index values regarding to the AC component and DC component out of the electrical signal from the first photodetector; and

a second index measuring apparatus to measure the other of the two index values regarding to the AC component and DC component out of the electrical signal from the second photodetector.

15. The apparatus of claim 14 wherein the first index measuring apparatus comprises a detector to detect the component of the predetermined frequency out of the electrical signal from the first photodetector.

16. The apparatus of claim 14 wherein the first index measuring apparatus comprises an AC detector to detect the AC component of the electrical signal from the first photodetector and the second index measuring apparatus comprises a DC detector

to detect the DC component of the electrical signal from the second photodetector.

17. The apparatus of claim 14 wherein the first index
5 measuring apparatus comprises a level detector to detect out
of the output from the first photodetector either a level of
the probe light having propagated the Raman amplifying medium
at a first power level of the binary-intensity-modulated Raman
pumping light or a level of the probe light having propagated
10 the Raman amplifying medium at a second power level of the
binary-intensity-modulated Raman pumping light; and
the second index measuring apparatus comprises a
detector to detect one of the AC component and the DC component
out of the output from the second photodetector.

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